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*Original Article*

# Antitussive Effect of *Rosa damascena* in Guinea pigs

Mohammad Nasser Shafei[a], Hassan Rakhshandah[b], Mohammad Hossain Boskabady[*a]

[a]*Department. of Physiology, Ghaem Medical Centre, Mashhad University of Medical Sciences, Mashhad, Iran.* [b]*Department of Pharmacology, Ghaem Medical Centre, Mashhad University of Medical Sciences, Mashhad, Iran.*

**Abstract**

Several therapeutic effects including hypnotic, antispasmodic, treatment of abdominal and chest pain and strengthening the heart have been described for the flowers of *Rosa damascena*. North American Indian tribes use a decoction of the roots obtained from the *Rosa damascena* plant as a cough remedy and to treat eye problem. Therefore, in the present study the antitussive effect of this plant in guinea pigs was evaluated. The antitussive effect of aerosols of two different concentrations of ethanolic extract (5 and10% w/v), aqueous extract (10 and 20% w/v), codeine, and saline were tested counting the number of cough produced due to aerosol of citric acid 10 min after exposing animal to aerosols of different solutions (n=6 for each solution). The results showed a significant reduction in the number of coughs obtained in the presence of both concentrations of ethanolic extract, higher concentrations of aqueous extract and codeine ($P<0.001$ for all cases). The number of coughs obtained in the presence of higher concentrations of extract was less than that of lower concentrations. However, this difference was only statistically significant for the aqueous extract. In addition the numbers of coughs obtained in the presence of both concentrations of ethanolic extract and higher concentrations of aqueous extract were not significantly different from that of codeine. These results indicated the antitussive effect of *Rosa damascena*, which was comparable to codeine at concentrations used.

**Keywords**: *Rosa damascena*; Antitussive effect; Guinea pig; Citric acid; Codeine.

## Introduction

*Rosa damascena* is an erect shrub 1 to 2 meter in height. Flowers of this plant are large, showy and colorful. Today, *Rosa damascena* is highly cultivated all over the world, including Iran (specially in Kashan), for visual beauty and its scent (1). This plant contains carboxylic acid (2), terpene, myrcene (3) and vitamin C (1).

In addition to perfuming effect, flowers, petals and hips (seed–pot) of *Rosa damascena* are also used for medical purposes. In ancient medical books several therapeutic effects of this plant, such as treatment of abdominal and chest pain, strengthening the heart (4), treatment of menstrual bleeding, digestive problems (5), and anti-inflammation (2) are reported. A recent study demonstrated anti-HIV effect for this plant (6). Essential oil from *Rosa damascena* is reported to have analgesic, hypnotic and antispasmodic effects (1, 7). In addition our two studies showed relaxant effect on tracheal smooth muscle (unpublished data) and analgesic effect (8). This plant also is used as a gentle laxative (9).

North American Indian tribes use a decoction of the root of *Rosa damascena* plant as a cough remedy and to ease children cough (1). In this study the antitussive effect of ethanolic and aqueous extracts of this plant were evaluated.

* Corresponding author:
E-mail: mhboskabady@hotmail.com

## Experimental

*Plant and extracts*

*Rosa damascena* was collected from

Mashhad in the spring of 2003 and identified by botanists in the herbarium of Ferdowsi University of Mashhad. The plant extracts were prepared as follow:

A) Aqueous extract: fifty grams of the chopped, dried flowers of plant were extracted with 300 ml distilled water by the soxhlet apparatus.

B) Ethanolic extract: The same amount of flowers was extracted with 300 ml ethanol by the soxhlet apparatus. The solvents used for obtaining both extracts were then removed under reduced pressure and concentrations of 10% and 20% w/v for aqueous extract and 5% and 10% w/v for ethanolic extract were prepared by dissolving them in saline. The extracted materials were 10g and 5g for aqueous and ethanolic extracts, respectively.

*Animals*

Dunkin-Hartley guinea pigs of both sexes used in the study (weighed between 500-600g) were purchased from Razi Institute, Mashhad, Iran.

*Assessment of antitussive activity*

The method used has been described previously (10). Unanaesthetized and unrestrained animals were placed individually in a transparent perspex chamber with dimensions of 30 x 20 x 20 cm and exposed to a nebulized aqueous solution of 0.1 g/ml citric acid for 7 min. The aerosol was produced by airflow of 8 l/min through a Wright nebulizer. The aerosol particles had a mass median aerodynamic diameter of 0.9µm as determined by laser light scattering (Malvern Instrument 2600 HSD analyser, malvern,U.K.). The volume of the solution delivered for each concentration was 4.5±0.28 ml. The output of nebulizer was 0.65±0.04 ml of solution per minute. The same nebulizer was used throughout the experiment. During the exposure, a trained observer continuously watched the animals, and the number of coughs was determined. The number of coughs produced during the last 5 min of exposure was counted. Coughs could easily be distinguished from sneeze, since there is a clear difference in sound as well as in behaviour of the animal (10).

The above protocol was performed 10 min after exposing animals to aerosols for a period of 7 min (n=6 for each solution). All of the experiments were performed randomly, with a 2 h resting period between each experiment.

*Statistical analysis*

All the data were expressed as mean±SEM. Comparison of the baseline data with the number of cough 5 obtained in the presence of plant extracts and codeine were made using ANOVA. Comparison of the data obtained in the presence of the two different concentrations of aqueous and macerated extracts was made using the student paired t-test. Significance was accepted at $p<0.05$.

## Results and Discussion

*Antitussive effect of ethanolic extract*

As shown in figure 1, the number of coughs in animals that received 5% and 10% concentrations of ethanolic extract were decreased to 11.33±0.71 and 10±0.36 respectively; this was found to be significantly different from that of the baseline value ($p<0.001$). However, the effect of both concentrations of the ethanolic extract was not significantly different from that of codeine. In addition there was no significant difference between the effects of the two concentrations of ethanolic extract.

*Antitussive effect of aqueous extract*

Both concentrations of aqueous extract caused a reduction in the number of coughs compared to the baseline value (13.83±0.60 and 10.66±0.49), but only the effect of the 20% concentration was significantly different with that of saline ($p<0.001$, Figure1).

Although antitussive effect of the ethanol extract was greater than that of the aqueous extract, there was no significant difference between the effects of high concentrations of two extracts. However, the effect of 10% concentration of ethanolic extract was significantly greater than the same concentration of the aqueous extract ($p<0.001$).

The present study demonstrated a relatively potent antitussive effect for both extracts obtained from *Rosa damascena.* The antitussive effects of only the aqueous extract was concentration dependent and the effect of higher concentration extracts was significantly greater than those of lower its concentrations. The antitussive effects of both extracts obtained from

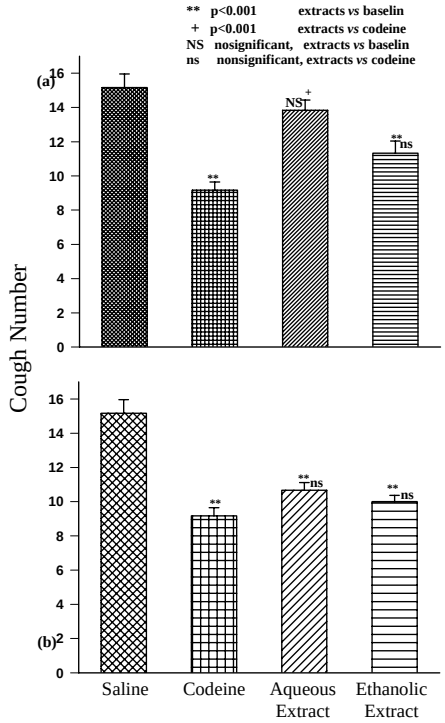


**Figure 1.** The number of coughs obtained in the presence of (a) lower concentrations of aqueous (10.0 % w/v) and ethanolic (5.0% w/v) extracts and (b) higher concentrations of aqueous (20.0% w/v) and ethanolic (10.0% w/v) extracts obtained from *R.damascena* compared to those obtained in the presence of saline (baseline) and codeine. Statistical differences between plant extracts and baseline values are shown by **: p<0.001 .N.S. shows a non significant difference. Statistical differences between the number of coughs obtained in the presence of plant extracts with that of codeine are shown by +: P<0.001 and ns shows a non significant difference.

*Rosa damascena* were comparable to codeine at concentrations used. However, the effect of the 10% ethanolic extract was significantly greater than that of the same concentration of the aqueous extract.

In the present study the antitussive effects of extracts obtained from *Rosa damascena* were evaluated using a standard method used previously by several investigators (10, 11).

Although the antitussive effects of different extracts of *Rosa damascena* were similar to that of codeine, the mechanism(s) of antitussive effect of this plant could not be concluded from the results of the present study.

The essential oil obtained from *Rosa damascena* is reported to have a relaxing effect on the gastrointestinal tract (2). Therefore, the bronchodilatory effect of extracts obtained from this plant could be responsible for its antitussive property as stated by Karlsson et al. (11).

Opioids, such as morphine and codeine, are generally considered to be the most potent and effective antitussive drugs available and believed to inhibit cough through suppression of a cough centre in the CNS (12, 13). Morphine was recently shown to reduce a vagally mediated bronchoconstriction produced by inhaled distilled water in asthmatics (14), and in healthy human subjects. The bronchoconstriction produced by the inhaled capsaicin was attenuated by nebulized codeine and morphine (15). The mechanism behind this inhibitory effect is unknown, but suppression of neurotransmitter release has been suggested. Inhibitory opioid receptors have been demonstrated on peripheral nerves (16), inducing vagal sensory neurones (17, 18). Some experimental data indicate that opioids may interact with the peripheral nervous system of the tracheobronchial tree. A partial antagonism of a noncholinergic neurogenic bronchoconstriction in the guinea pig by opioid agonists has been reported (19-21). Karlsson et al. (11) also showed that nebulized codeine and morphine can inhibit bronchoconstriction and cough induced by citric acid, using a method similar to that of the present study. Therefore, the similar antitussive effect of extracts obtained from *Rosa damascena* and codeine may indicate that the antitussive effect of this plant is due to its bronchodilator property. Previous studies (1, 3) also showed the analgesic effect of *Rosa damascena*, which is due to opioidal properties of this plant (8). Therefore, the existence of opioidal effect in this plant could be responsible for its' antitussive effect.

However, cough could be induced by irritation of the sensory receptors located within and immediately below the epithelial lining. Sites of airway branching may be particulary sensitive to tussive stimuli (22). Sensory receptors mediating reflex bronchoconstriction seem, however, to be distributed all along the tracheobronchial tree (23). Advenier el al (24) showed that the tachykinin receptor antagonists have also an antitussive effect. In addition one possible mechanism responsible for bronchodilatory effect seen for this plant is inhibition of the stimulatory nonadrenergic noncholinergic (NANC) nervous system (25). Therefore, the antitussive effect of *Rosa damascena* might be due to its possible tachykinin inhibitory substance(s) content mediating both bronchodilatory and antitussive effects.

With regard to the inflammatory effect of tachykinin and because *Rosa damascena* has an anti-inflammatory effect (2), the antitussive effect of this plant could be due to its anti-inflammatory effect. However, the anti-inflammatory effect of *Rosa damascena* does not seem to occur in a short period of time and is not effective in the time period used in the present study. Therefore, the mechanism(s) of antitussive effect of *Rosa damascena* should be investigated in further studies.

The difference in antitussive effect of the two extracts is perhaps due to the methods of extraction and difference in the ingredient of extracts. The non-significant difference pbtained between the two concentrations of ethanolic extract could indicate that the maximum effect is obtained at its lower concentration.

In conclusion, the results obtained from the present study signify the antitussive effect of *Rosa damascene*, which was comparable to that of codeine; the antitussive effect of the ethanolic extract was found to be greater than of the aqueous extract. However, the exact mechanism(s) of this effect should be clarified in further studies.

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